Mobile Satellite Bands Between 1-30 GHz

F. Davarian and P. Robbins

Jet Propulsion Laboratory

The recent surge in mobile and personal communications has placed new demands on radio spectrum usage in the Earth-to-space direction. In response to this demand, the 1992 World Administrative Radio Conference (WARC-92) revised the table of frequency allocations for mobile-satellite applications. As a result of this revision, additional spectrum became available for mobile-satellite applications. Since there is only a finite amount of spectrum available, what was gained by one radio service has in some cases been lost by others. To allow transition time for radio services that may be forced to relocate as a result of WARC-92 decisions, irnplementati.on of new allocations may not take effect for a few years, if not longer. As most of the proposed mobile-satellite services will take time to develop, the gradual availability of the spectrum allocated at WARC-92 should proceed without due concern for the effected services. This assumes, of course, that the technical issues associated with relocating these services, as well as any sharing agreements can be worked out.

The mobile-satellite service is a young industry that suddenly finds itself in the limelight. Therefore, unlike its terrestrial counterpart, it has not yet developed traditional ways of doing business. possibly because of this reason, or simply due to the urgency of the task, some WARC-92 allocations were made without benefit of standards for the coordination, sharing, and operation of different systems. For example, we find allocations that permit the sharing of the spectrum between different mobile-satellite, fixed-satellite, and/or terrestrial services without specifying how these conflicting applications can operate in harmony with each other.

Figure 1 shows mobile-satellite bands between 1 and 30 GHz. The vertical. axis indicates allocated bandwidth in MHz; the horizontal axis indicates the center of a specific allocated band. For example, 4 MHz is allocated to the mobile-satellite service with a center frequency of 1557 MHz.

In Figure 1, the direction of transmission in a band is indicated by an arrow. An up arrow indicates Earth-to-space and a down arrow indicates space-to-Earth. For instance, a pair of aeronautical exclusive bands with center frequencies of 1550 MHz (down) and 1651.5 MHz (up), each 10 MHz wide, are shown in Figure 1. Letter I's" denotes that. an allocation is a secondary (as opposed to primary) radio service. An allocation not identified with an "S" is a primary service.

Figure 1 shows that a large amount of spectrum is available for mobile satellite applications from 1-30 GHz. At 20.7 GHz, 1000 MHz is allocated for space-to-Earth use. Band availability is also good at the lower frequencies with over 320 MHz allocated between 2-3 GHz . One should however, exercise caution when selecting a band because some of the allocations are not without strings attached to them. A list of some of the things to be aware of when looking at spectrum allocations is given below:

Several new allocations were made to the mobile-satellite service at WARC-92 without benefit of standards for the coordination, sharing, and operation of such systems.

- The mobile-satellite bands listed on the accompanying chart are shared with other radio services. All services within a shared band should be compatible.

Primary radio services share spectrum equally with other primary radio services in a band.

Caution should be used when selecting a band where primary status depends upon successful coordination under the provisions of Article 14 of the Radio Regulations]. A specific example is the 7250 MHz - 7450 MHz band.

- If a mobile-satellite allocation status is secondary, the system can not cause harmful interference to primary services operating in the band. Further, a secondary service can not cause harmful interference to other secondary services that were brought into operation at an earlier date.

- Footnotes and provisions are very important when researching the utility of a particular band. In the band 1613.8 - 1626.5 MHz , transmission is permitted in the Earth-to-space and space-to-Earth direction. However, Footnote 731Y requires that transmission in the space-to-Earth direction consider the provisions of Resolution 46[2](WARC-92).

- A band may be allocated to a particular radio service in the United States, but not in other countries e.g., 7450-7750 MHz and 8025-8400 MHz are allocated to the mobile--satellite service only in the U.S.

- September '93 and January '94 revisions to the National Telecommunications and Information Administration (NTIA) Manual include all of the WARC'-92 decisions in the international table; but national implementation includes only WARC-92 decisions in the 410-420 MHz and the 2200-2290 MHz bands. Note: There are no mobile-satellite allocations in either of these bands.

It is expected that complete implementation of WARC-92 decisions into both the NTIA Manual and CFR 47 (FCC Rules and Regulations) will take some time. Because WARC-92 decisions are only partially incorporated into the United States allocation table, spectrum planners should have access to WARC-92 results, and current spectrum management manuals and procedures (NTIA and/or FCC).

Note: Figure 1 depicts two 10-MHZ bands (solid bars) that are allocated exclusively to the aeronautical-mobile satellite (R) service[3]. Although the other mobile-satellite bands shown in Figure 1 are not specifically allocated for aeronautical purposes, they are allocated for mobile-satellite use, which by definition, should not exclude them from being used to support the aeronautical services.

[1] Article 14 is a "supplemental coordination" procedure that requires an administration whose proposed service or network may affect another administrations's system or network, to first obtain the affected administration's agreement,

[2] Resolution 46, also known as Resolution Com5/8, is entitled: "Interim Procedures for the Coordination and Notification of Frequency Assignments of Non-Geostationary-Satellite Networks in Certain Space Services and Other Services to Which the Bands are Allocated".

[3] The aeronautical mobile-satellite (R) service is a service reserved for communications relating to flight safety and regularity of flight, primarily along national or international civil air routes. The (R) indicates "route"; (OR) indicates "off route".

Figure 1. Mobile Satellite Bands Between 1-30 GHz